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Mori

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(54) **PROCESS CARTRIDGE, DEVELOPER CARTRIDGE, AND IMAGE FORMING DEVICE**

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(51) **Int. Cl.**
G03G 21/16 (2006.01)

(52) **U.S. Cl.** **399/111**

(58) **Field of Classification Search** 399/111–114
See application file for complete search history.

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(57) **ABSTRACT**

A developer cartridge includes a first developer wall formed with a convex part and a second developer wall disposed in confronting relation with the first developer wall. The convex part of the first developer wall is insertable into an insertion portion of an image-bearing member cartridge when the developer cartridge is mounted on the image-bearing member cartridge. When a plurality of the developer cartridges are stacked one on the other with the first developer wall being downside with respect to the second developer wall facing upward, the first developer engagement part in one developer cartridge engages the second developer engagement part in another developer cartridge disposed just below the one developer cartridge.

11 Claims, 12 Drawing Sheets

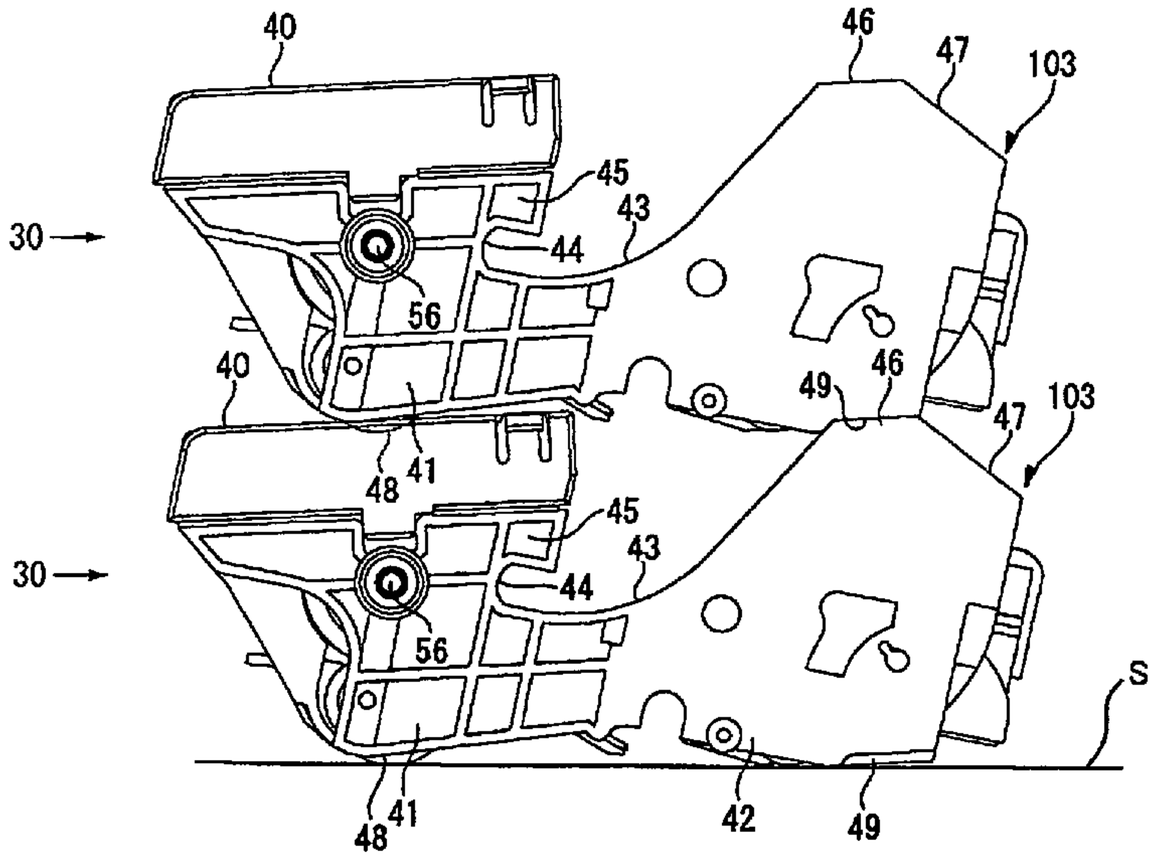

FIG.1

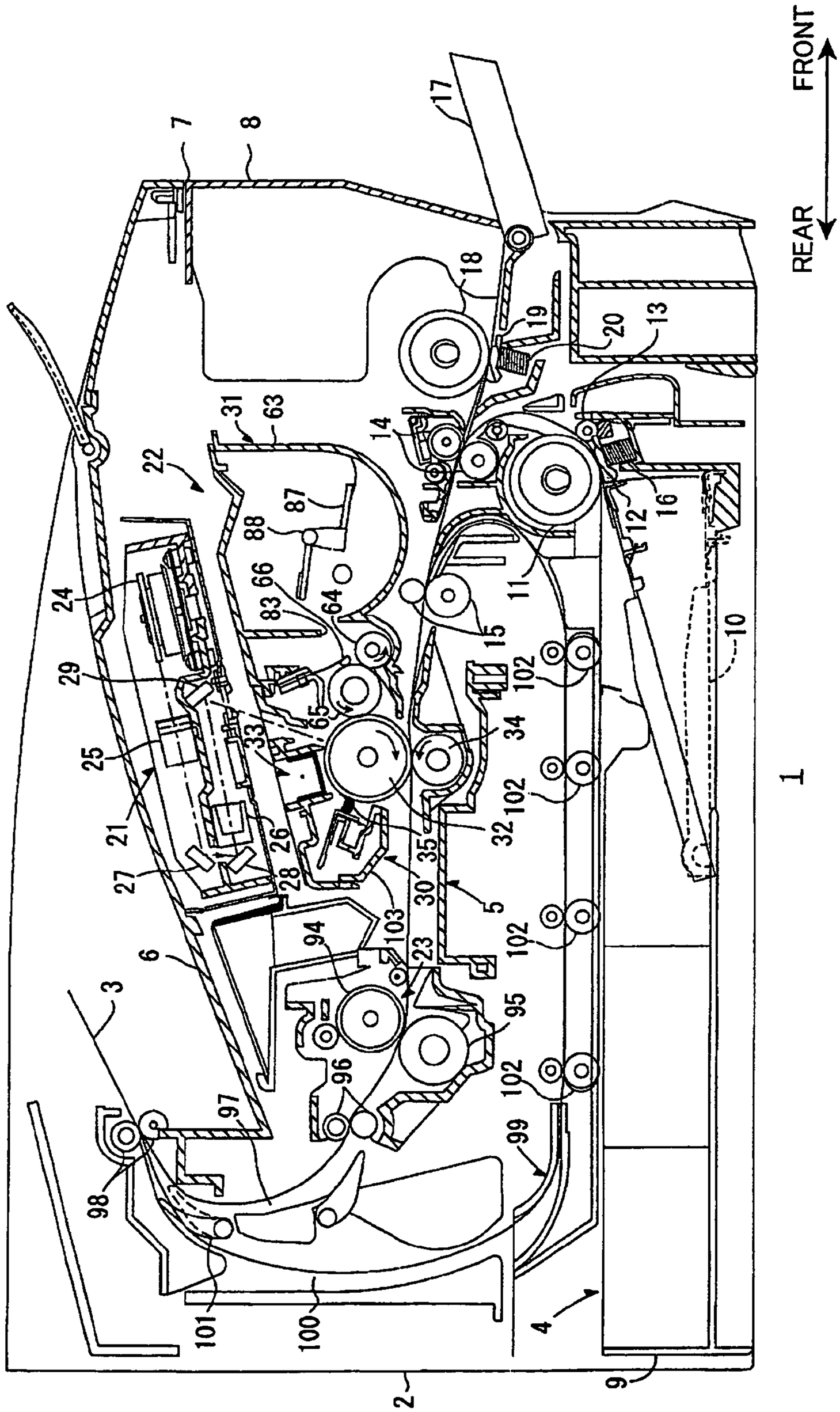
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FIG.2

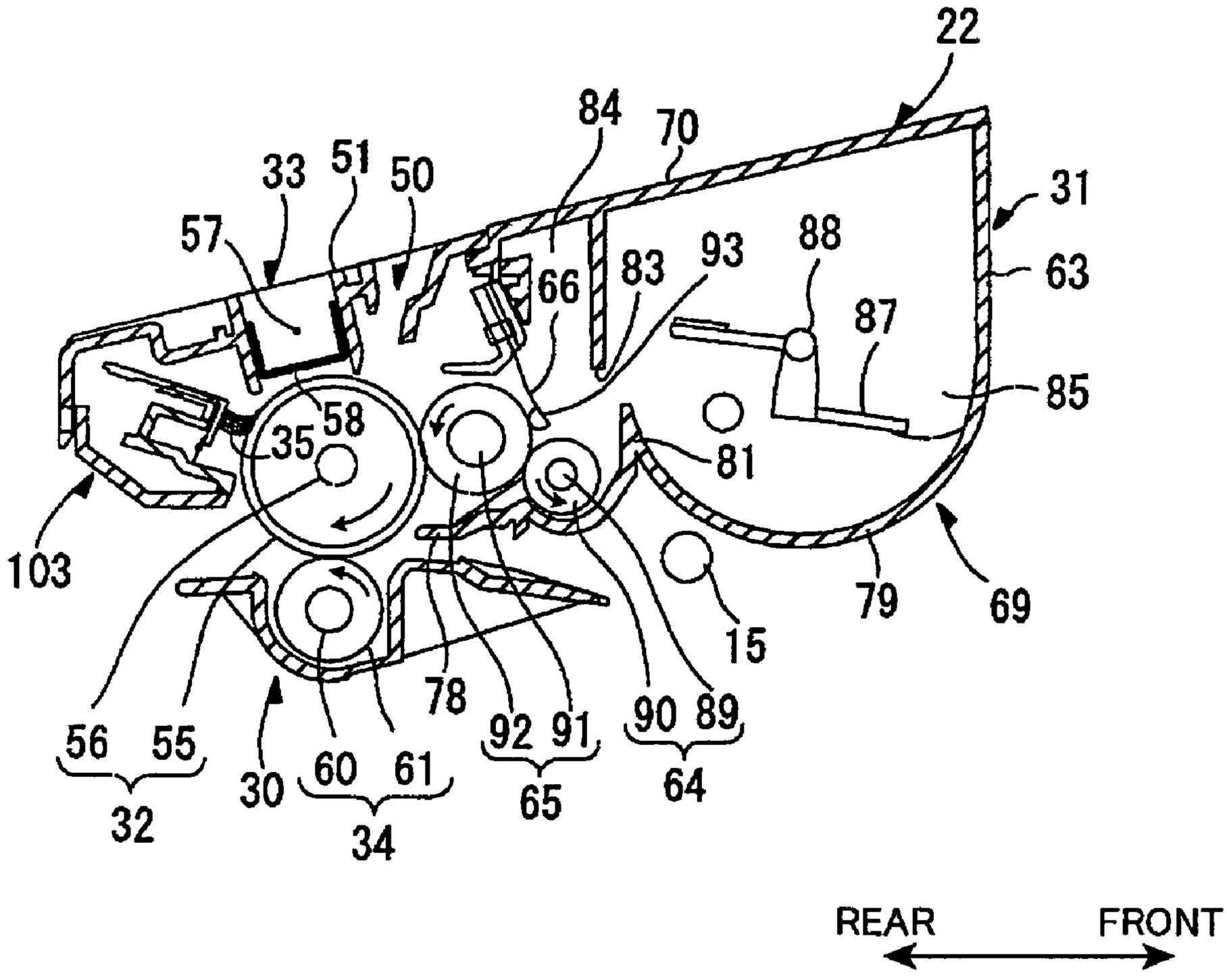
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FIG.3

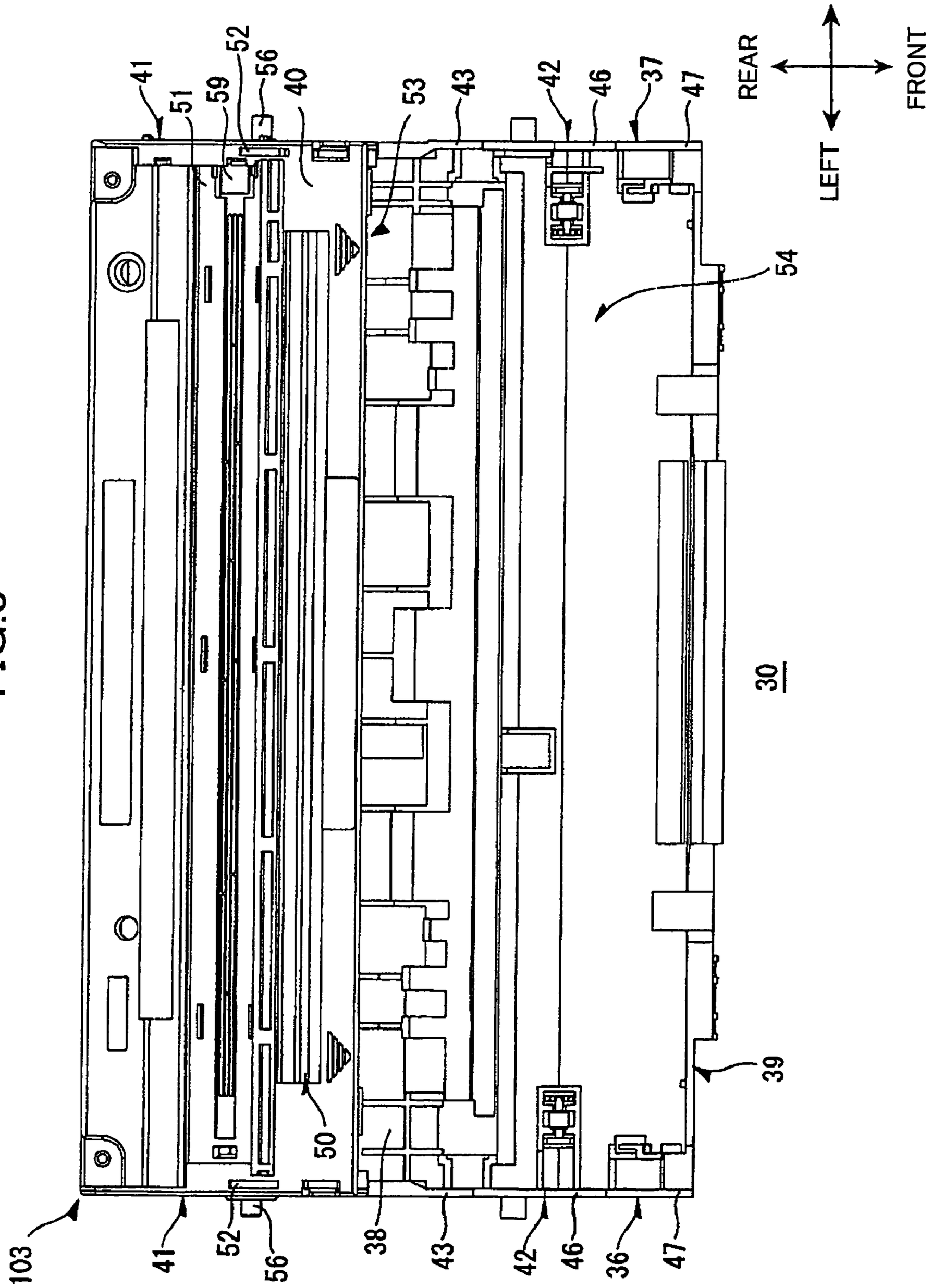
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FIG.4

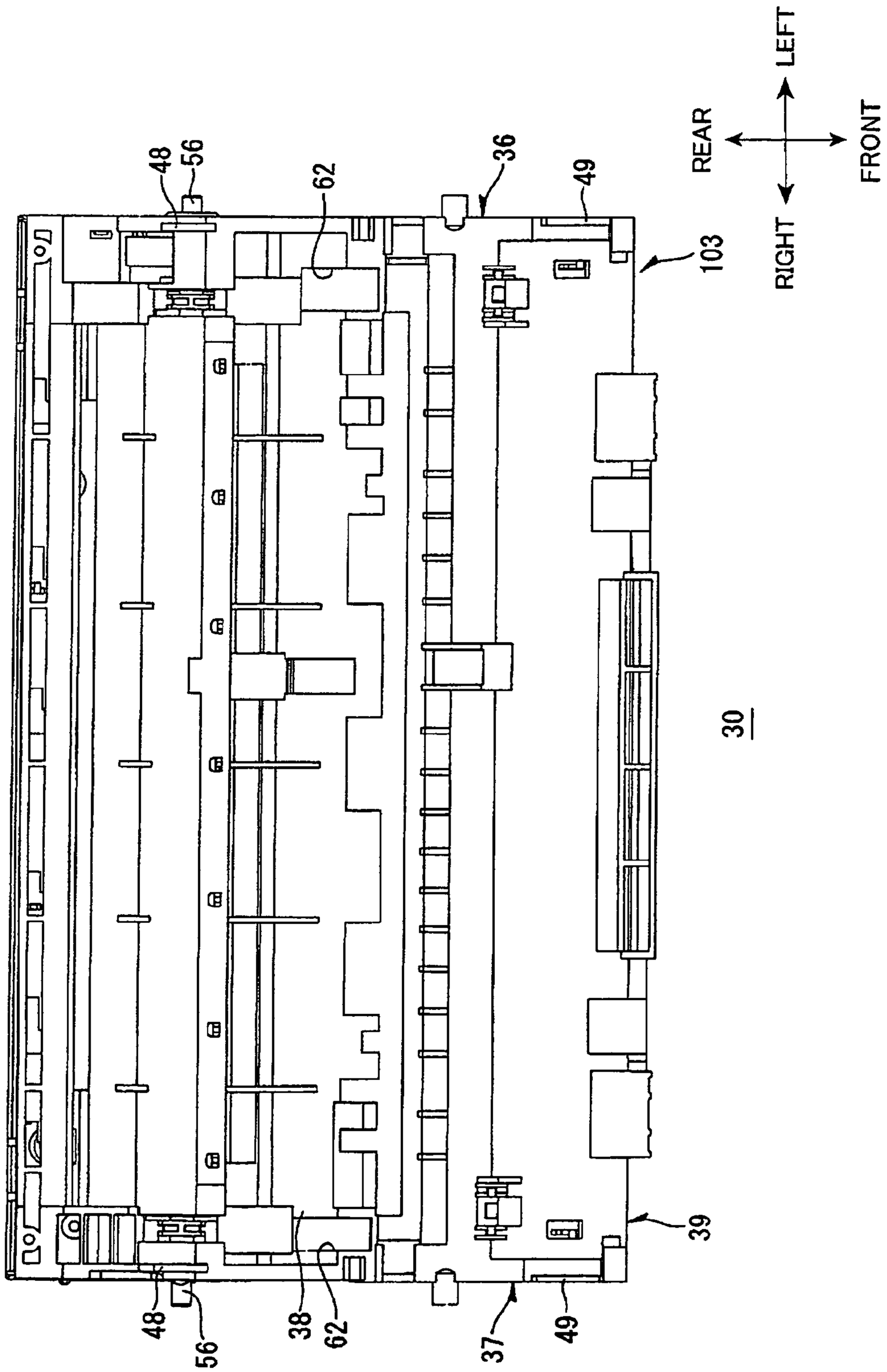
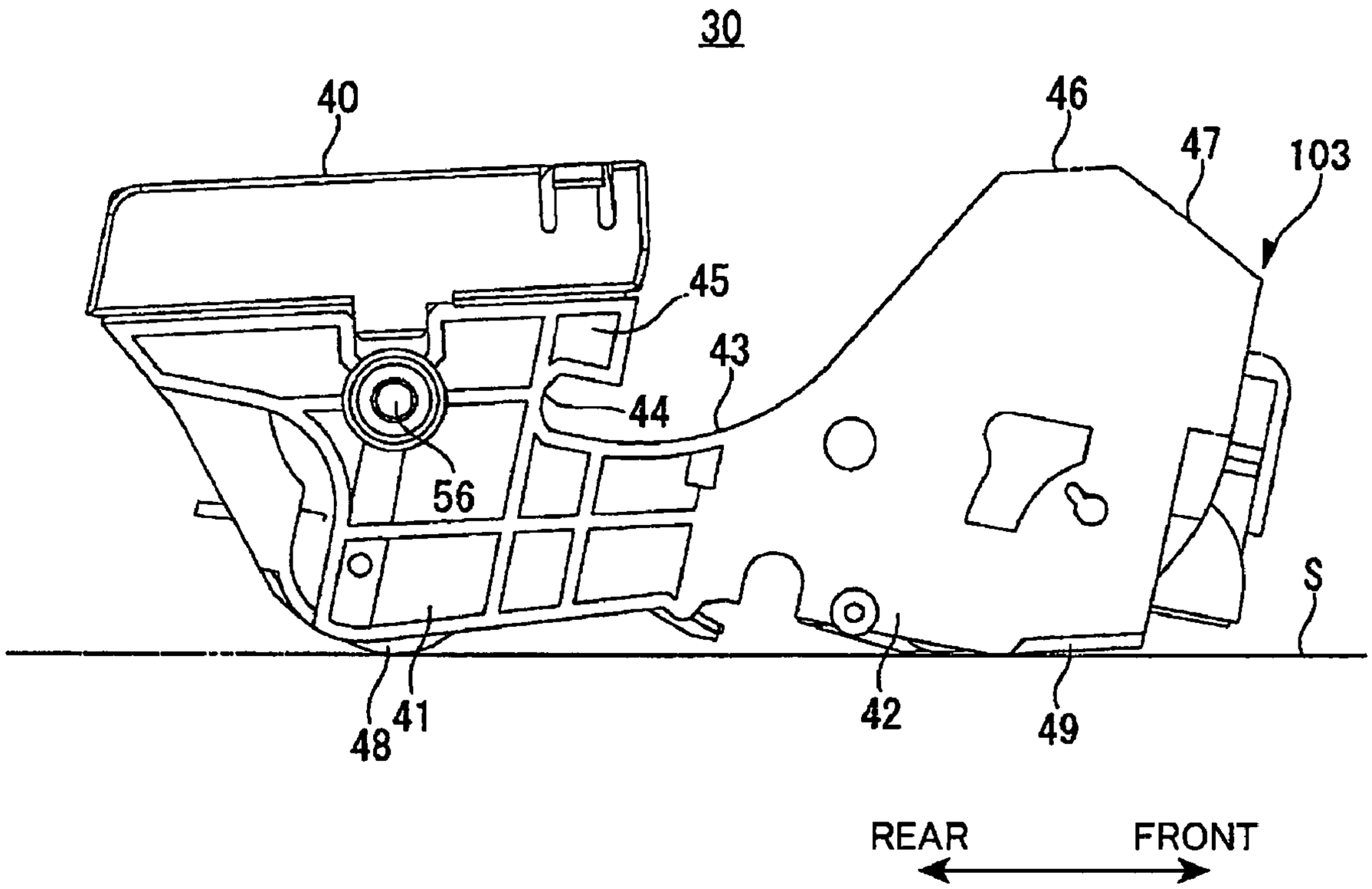


FIG.5



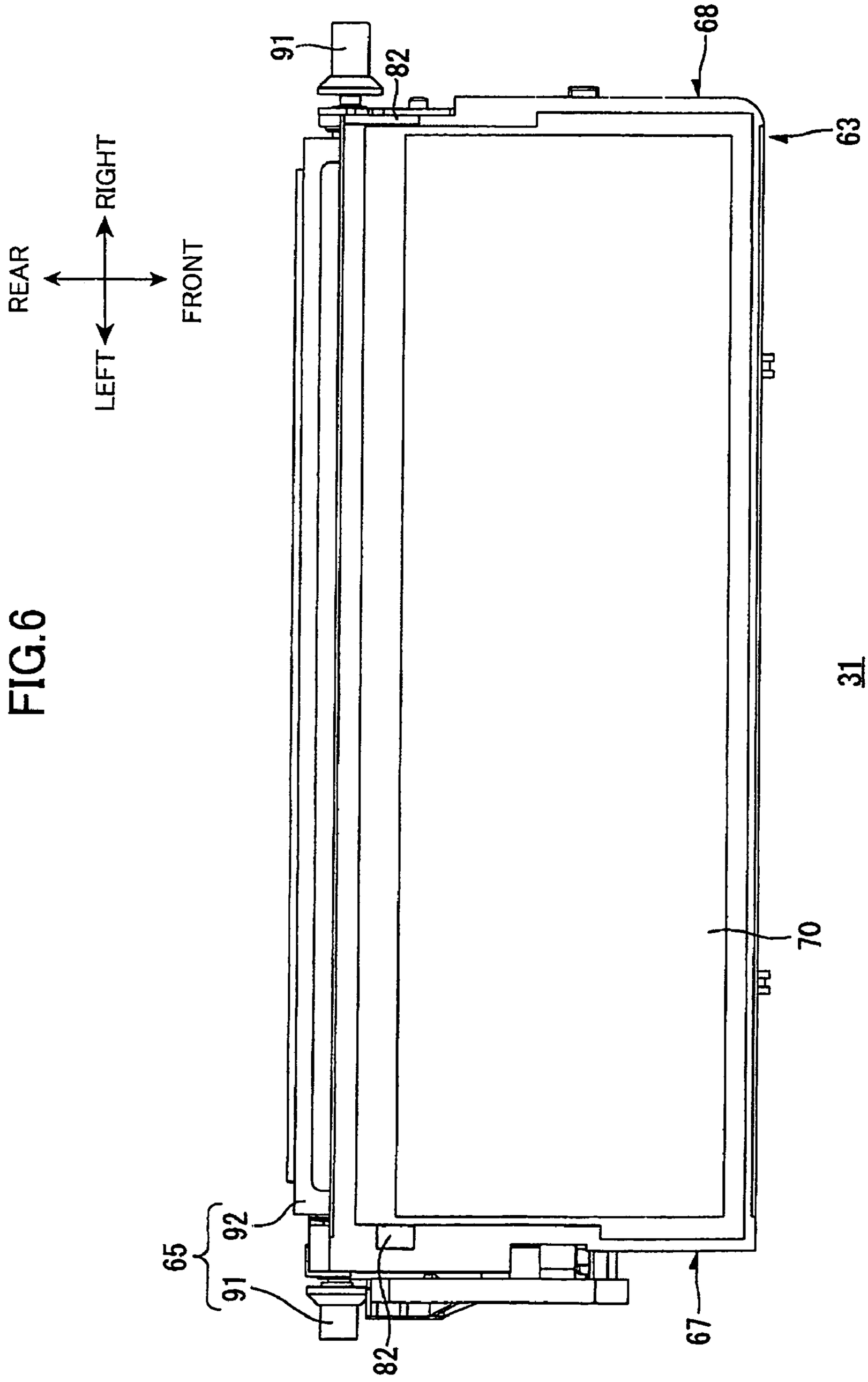
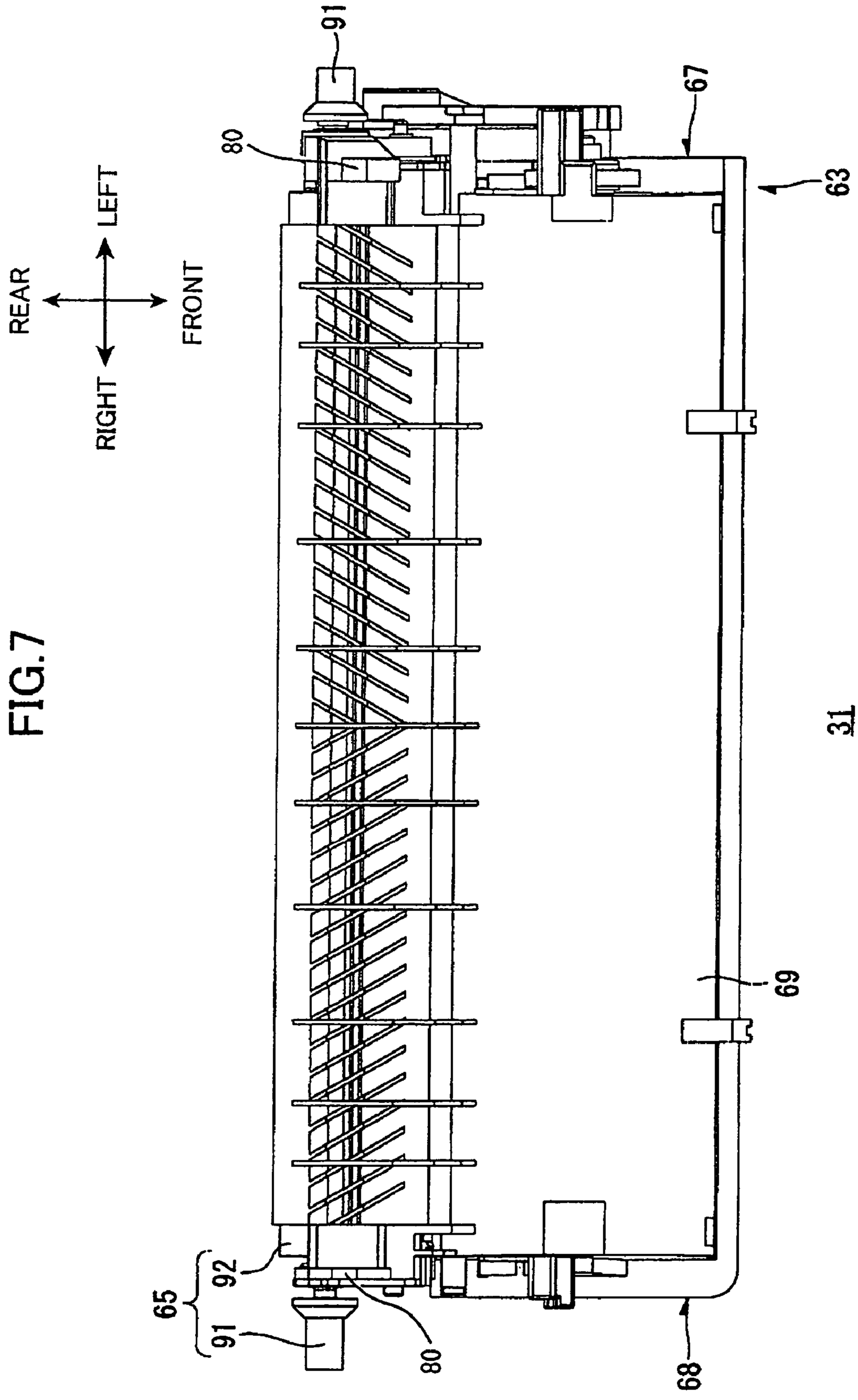


FIG.6

FIG.7



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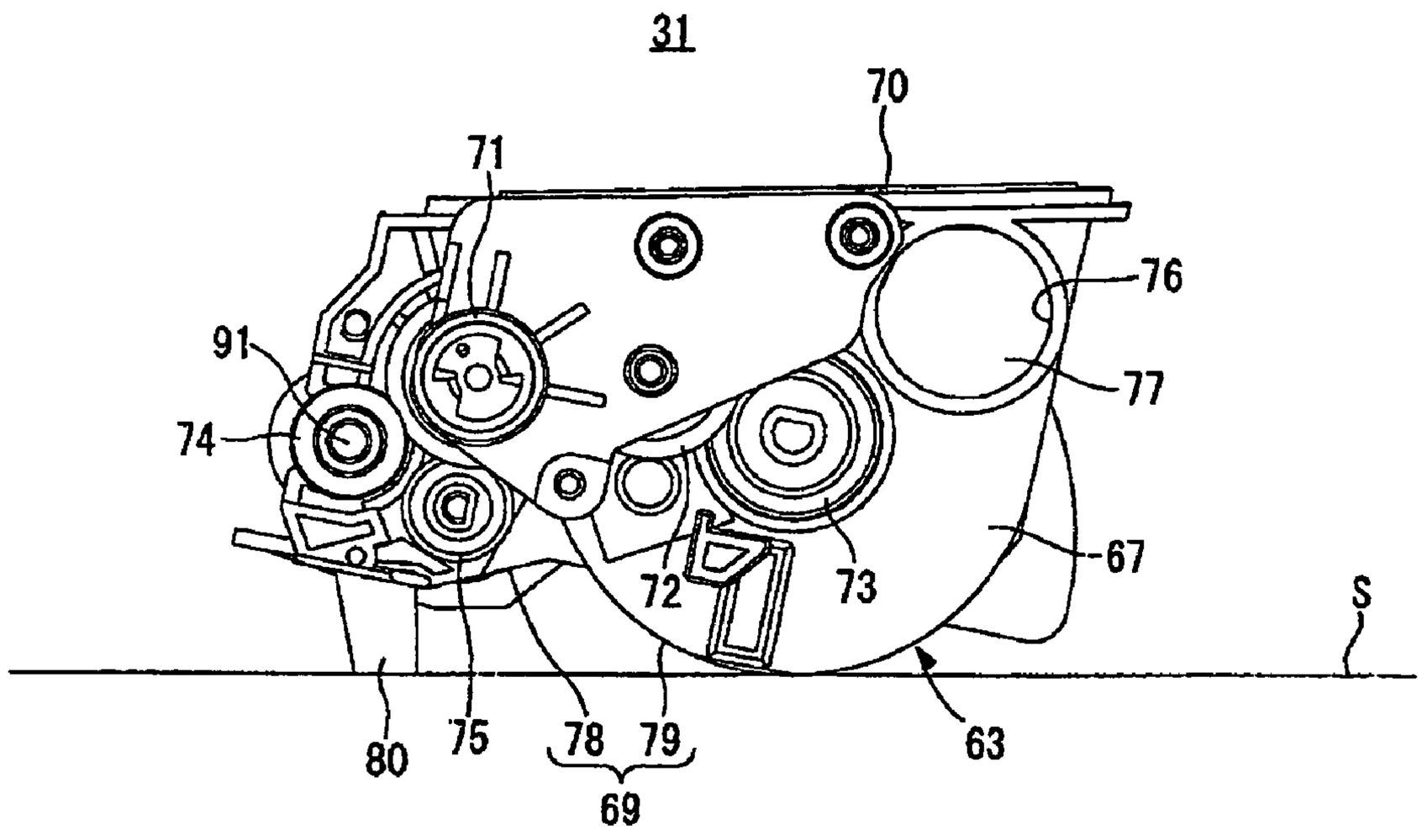
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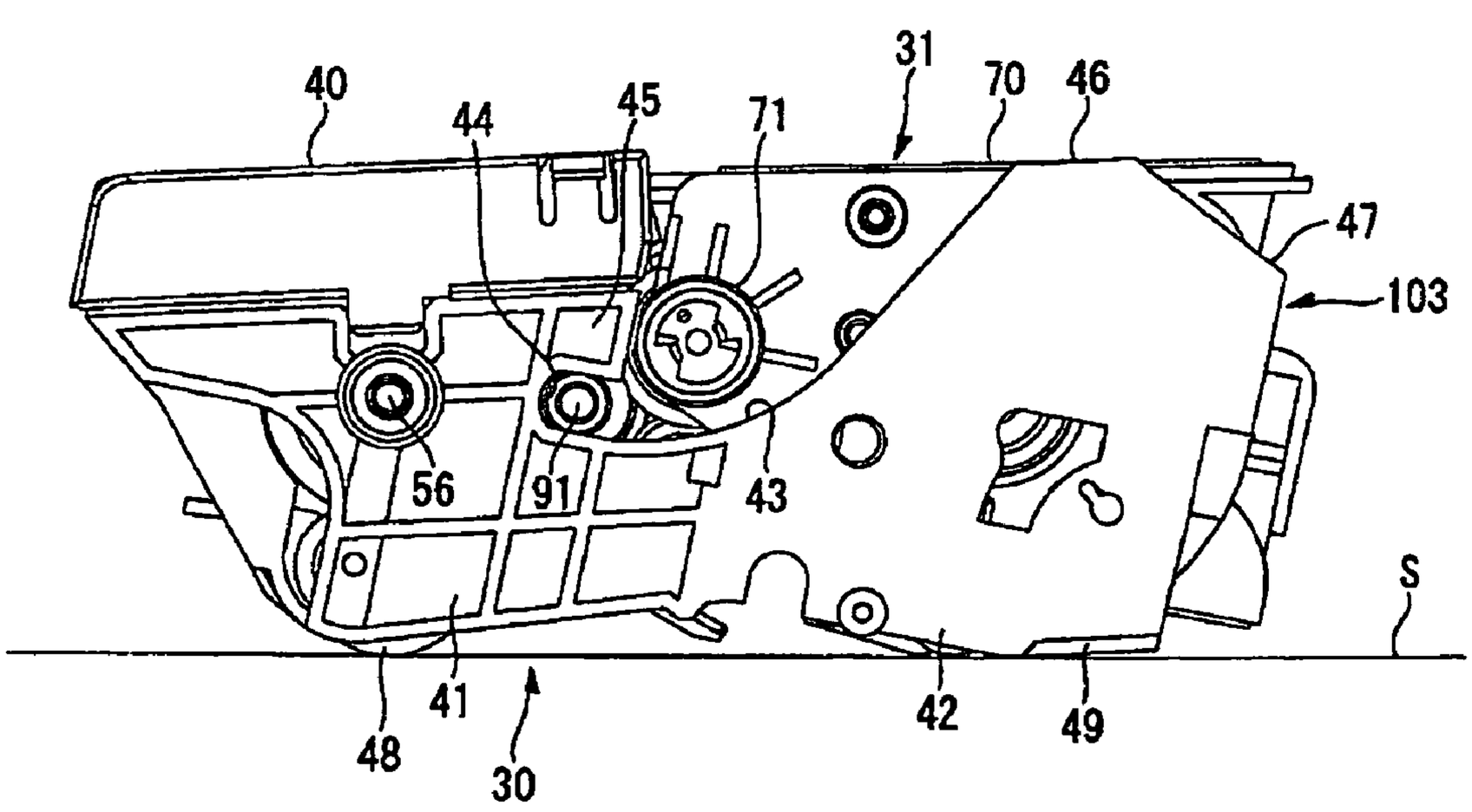
FIG.9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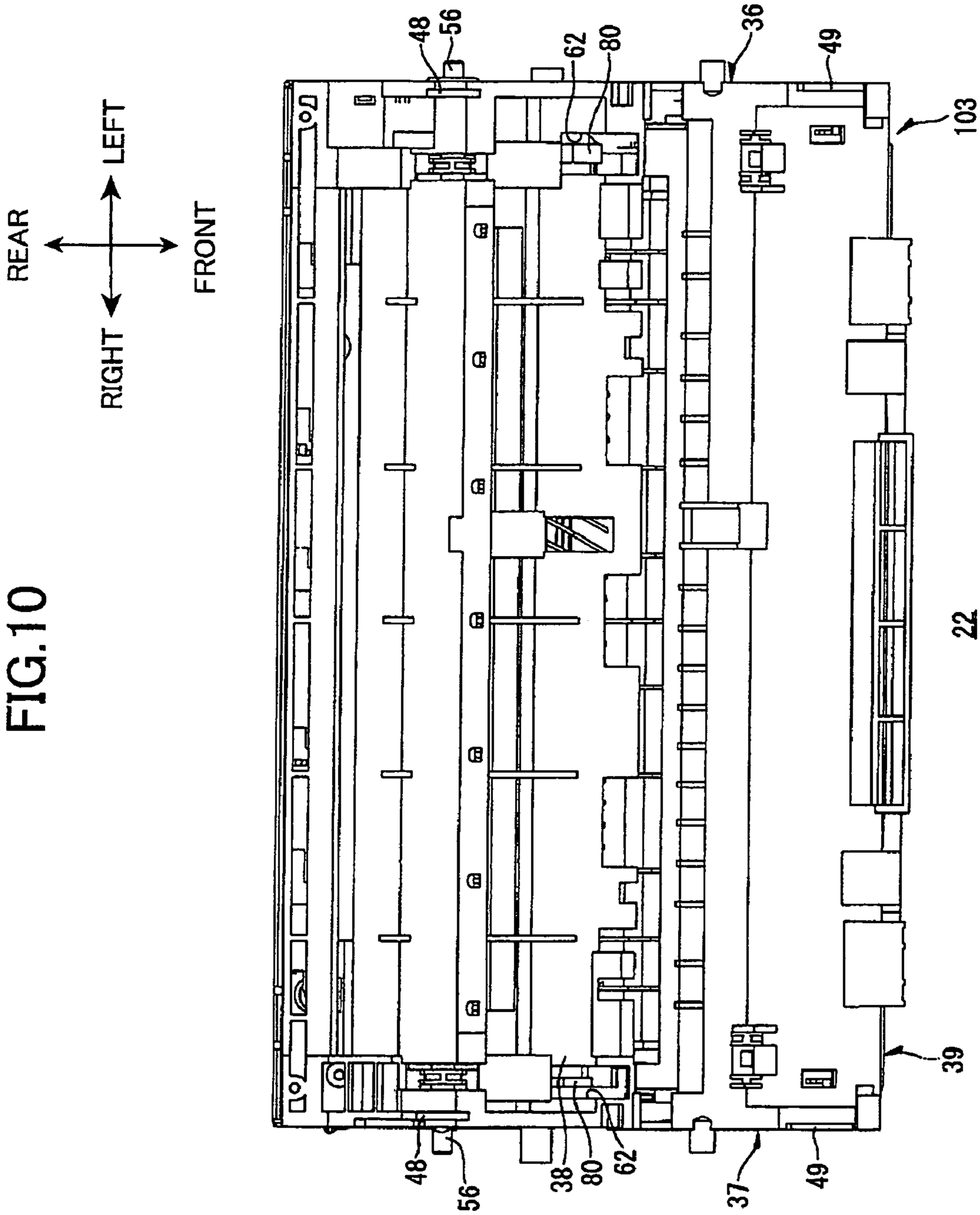

FIG.10

FIG.11

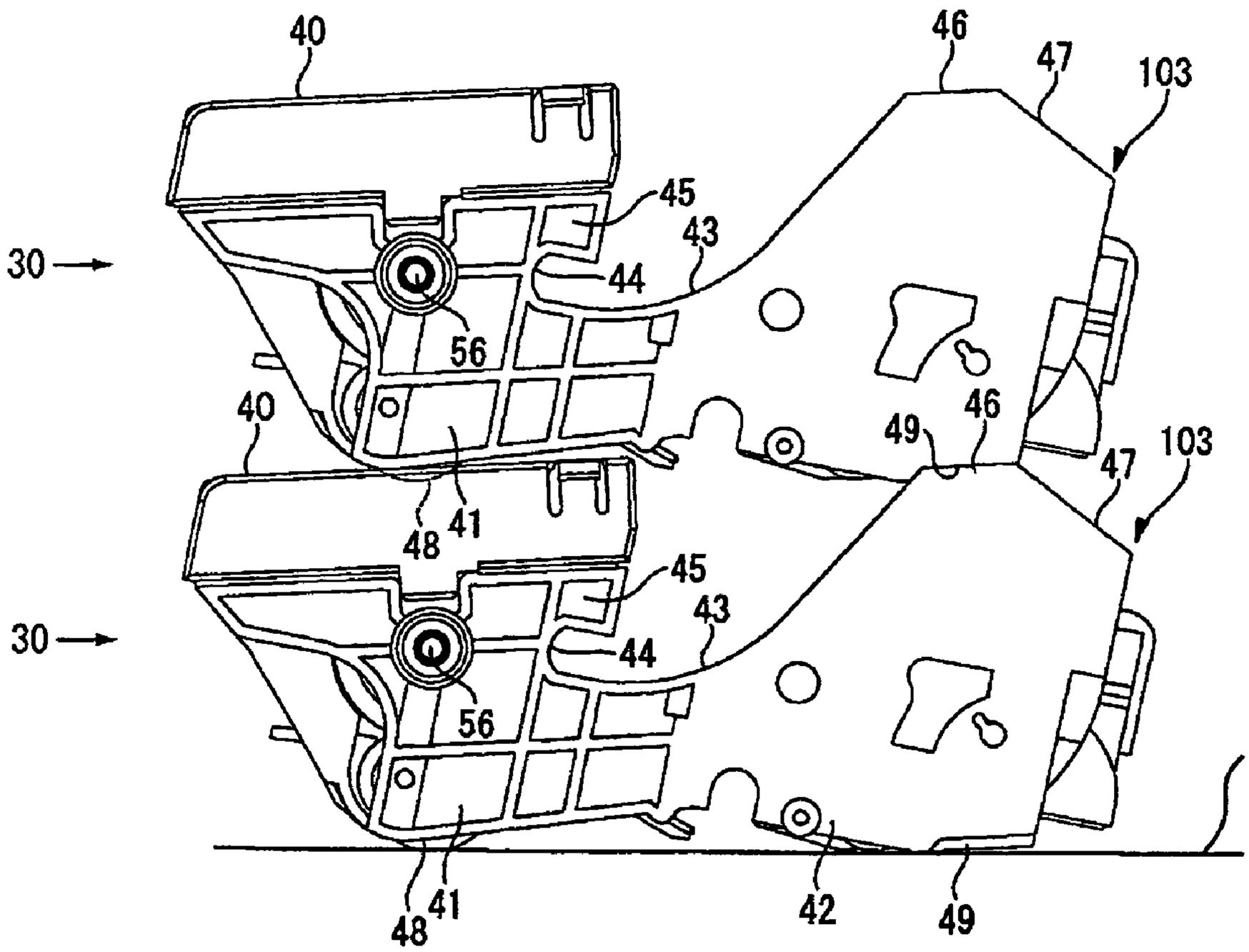
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FIG.12

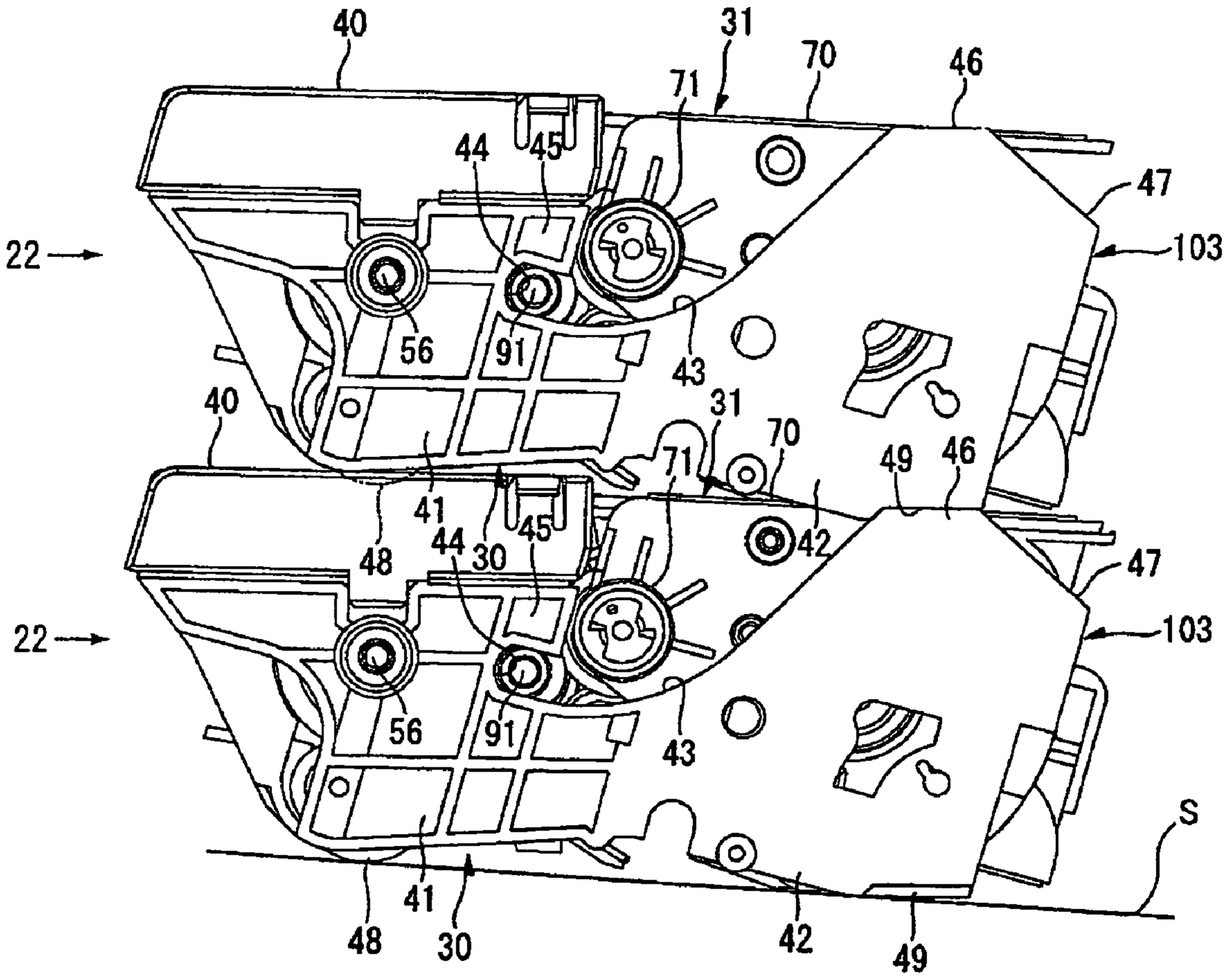
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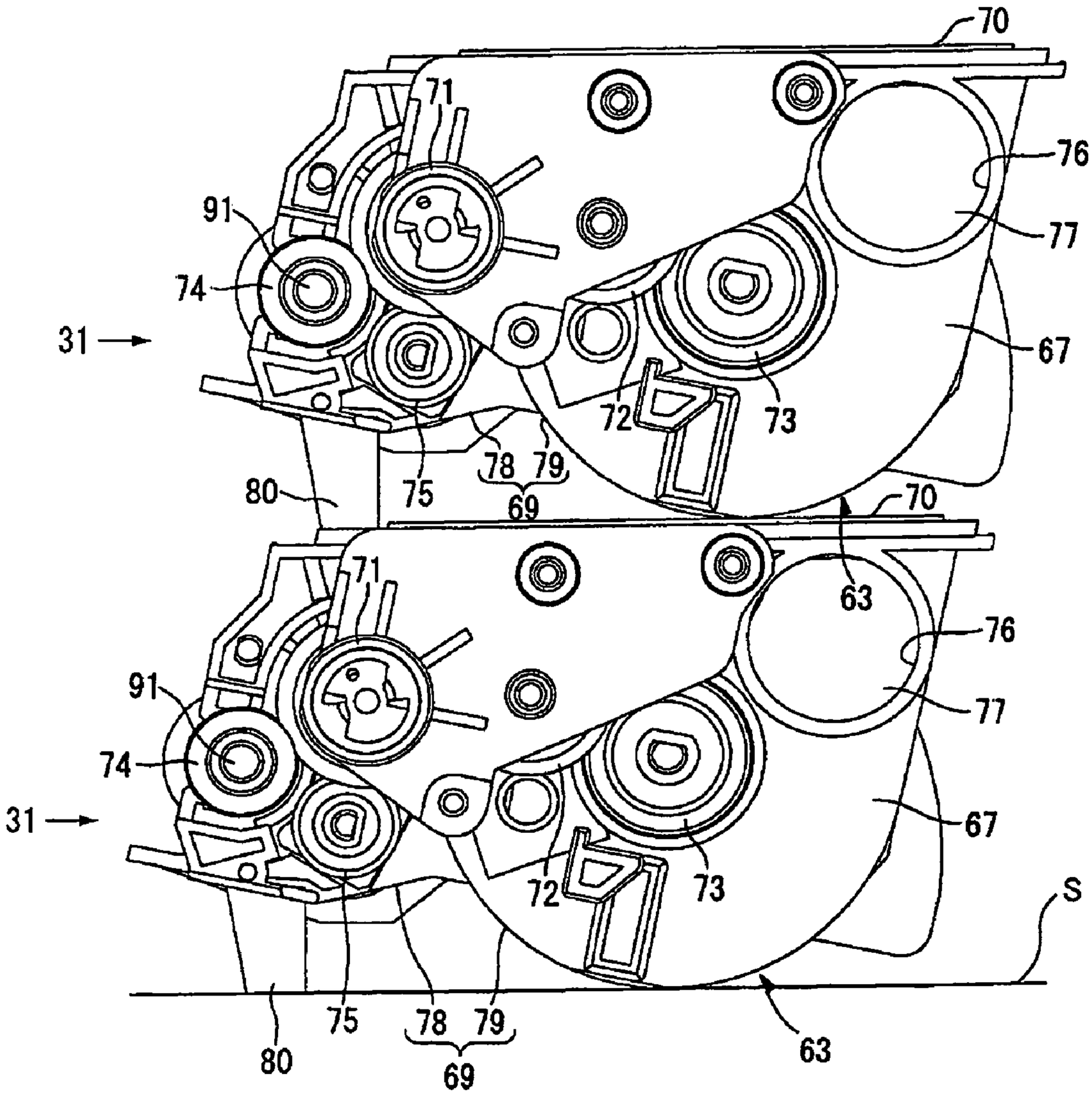
FIG.13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PROCESS CARTRIDGE, DEVELOPER CARTRIDGE, AND IMAGE FORMING DEVICE

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority from Japanese Patent Application No. 2005-021991, filed Jan. 28, 2005, the contents of which are hereby incorporated by reference into the present application.

TECHNICAL FIELD

The disclosure relates to an image forming device such as a laser printer, and a process cartridge and a developer cartridge which are, in use, mounted on the image forming device.

BACKGROUND

Conventional image forming devices such as a laser printer use a photosensitive cartridge in which a photosensitive drum is rotatably supported. A developer cartridge is also used therein for supplying the photosensitive drum with toner. The photosensitive cartridge and the developer cartridge are mountable to and detachable from the main body of the device. Only necessary one or ones of the cartridges can be replaced with a new one when the lifetime of the cartridge is ended.

Japanese Patent Application Publication No. 2000-267547 discloses a photosensitive cartridge, for use in an image forming device. The photosensitive cartridge has a flat lower surface facilitating to place the cartridge removed from the image forming device on a flat table.

With the photosensitive cartridge according to the proposal described above, the cartridge can be placed stably on a flat plane. However, the shape of the upper surface of the cartridge does not allow another photosensitive cartridge to be stacked thereon. Typically, a manufacturer collects and stores, in a stock room, old photosensitive cartridges or developer cartridges detached from the main body of the device for recycling In this case, it is convenient if the cartridges can be stacked one on the other. Otherwise, inconvenience is caused in handling the old cartridges and a large space is required for storage.

SUMMARY

In view of the foregoing, it is an object of the present invention to provide a process cartridge and a developer cartridge which can be stacked stably, without packing the cartridges in boxes, and an image forming device including such a process cartridge or developer cartridge.

In order to attain the above and other objects, the present invention provides a process cartridge being detachably mountable in an image-forming device. The process cartridge includes a main casing. The main casing includes a first wall, a second wall, and a third wall. The first wall is formed with at least one first engagement part. The second wall is formed with at least one second engagement part. The second wall is disposed in confronting relation with the first wall. The third wall connects the first wall and the second wall. When a plurality of the process cartridges are stacked one on the other with the first wall being downside with respect to the second wall, the first engagement part in one process cartridge engages the second engagement part in another process cartridge disposed just below the one process cartridge.

According to another aspect of the present invention provides a developer cartridge, detachably mountable in an image-bearing member cartridge. The developer cartridge includes a developer main casing. The developer main casing includes a first developer wall and a second developer wall. The first developer wall is formed with a convex part. The second developer wall is formed with an insertion portion inserted by the convex part when the developer cartridge is mounted on the image-bearing member cartridge. The second developer wall is disposed in confronting relation with the first developer wall.

According to another aspect of the present invention provides a developer cartridge being detachably mountable in an image-bearing member cartridge. The developer cartridge includes a developer main casing. The developer main casing includes a first developer wall and a second developer wall. The first developer wall is formed with a first developer engagement part. The second developer wall is formed with a second developer engagement part. The second developer wall is disposed in confronting relation with the first developer wall. When a plurality of the developer cartridges are stacked one on the other with the first developer wall being downside with respect to the second developer wall facing upward, the first developer engagement part in one process cartridge engages the second developer engagement part in another developer cartridge disposed just below the one developer cartridge.

According to another aspect, of the present invention provides an image-forming device. The image-forming device includes a process cartridge. The process cartridge includes a main casing. The main casing includes a first wall, a second wall, and a third wall. The first wall is formed with at least one first engagement part. The second wall is formed with at least one second engagement part. The second wall is disposed in confronting relation with the first wall. The third wall connects the first wall and the second wall. When a plurality of the process cartridges are stacked one on the other with the first wall being downside with respect to the second wall, the first engagement part in one process cartridge engages the second engagement part in another process cartridge disposed just below the one process cartridge.

According to another aspect of the present invention provides an image-forming device. The image-forming device includes a developer cartridge being detachably mountable in an image-bearing member cartridge. The developer cartridge includes a developer main casing. The developer main casing includes a first developer wall and a second developer wall. The first developer wall is formed with a convex part. The second developer wall is formed with an insertion portion into which the convex part is inserted when the developer cartridge is mounted on the image-bearing member cartridge. The second developer wall is disposed in confronting relation with the first developer wall.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. **1** is a side cross-sectional view of a main part of a laser printer according to a preferred embodiment of the present invention;

FIG. **2** is a side cross-sectional view of a process cartridge shown in FIG. **1**;

FIG. **3** is a plan view of a drum cartridge shown in FIG. **1**;

FIG. **4** is a bottom view of the drum cartridge shown in FIG. **1**;

FIG. **5** is a side view of the drum cartridge shown in FIG. **1**;

FIG. **6** is a plan view of a developer cartridge shown in FIG. **1**;

FIG. **7** is a bottom view of the developer cartridge shown in FIG. **1**;

FIG. **8** is a side view of the developer cartridge shown in FIG. **1**;

FIG. **9** is a side view of the process cartridge shown in FIG. **1** when the developer cartridge is mounted on the drum cartridge;

FIG. **10** is a bottom view of the process cartridge shown in FIG. **1**, when the developer cartridge is mounted on the drum cartridge;

FIG. **11** is a side view of the process cartridge shown in FIG. **1**, when the drum cartridges are stacked;

FIG. **12** is a side view of stacked process cartridges each shown in FIG. **1**, when each developer cartridge is mounted on the drum cartridge; and

FIG. **13** is a side view of stacked developer cartridges each shown in FIG. **1**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A preferred embodiment of the present invention will be described while referring to the accompanying drawings wherein like parts and components are designated by the same reference numerals to avoid duplicating description.

<Overall Structure of Laser Printer>

FIG. **1** is a side cross-sectional view showing a laser printer as an image forming device according to an embodiment of the present invention. In FIG. **1**, the laser printer **1** has a feeder section **4** and an image forming section **5**, in a body casing **2**. The feeder section **4** serves to feed a paper sheet **3** as a recording medium. The image forming section **5** serves to form an image on the paper sheet **3**.

<Structure of Body Casing **2**>

A sheet discharge tray **6** for receiving the paper sheet **3** on which an image has been formed is formed on the upper surface of the body casing **2**. On one side of the sheet discharge tray **6**, an operation panel having operation keys, and an LED display portion are provided. Further, an opening **7** through which a process cartridge **22** to be described in detail is detachably mounted is formed on the side wall at the operation panel side in the body casing **2**. A front cover **8** is provided for opening and closing the opening **7**. The front cover **8** is pivotably movably supported by a cover shaft (not shown) inserted in a lower end portion of the front cover **8**. The front cover **8** is pivotably moved to selectively open and close the opening. Specifically when the front cover **8** is opened (tilted), the opening **7** is opened whereas when the front cover **8** is closed, the opening **7** is closed. Through the opening **7**, the process cartridge **22** can be mounted on and detached from the body casing **2**.

In the description below, the side in which the front cover is provided is defined as the "front side" of this laser printer **1**, and the opposite side is as the "rear side". The direction perpendicular to sheet of drawing in FIG. **1** is defined as the widthwise direction of the laser printer **1**.

<Structure of Feeder Section>

The feeder section **4** includes a sheet feed tray **9**, a sheet press plate **10**, a sheet feed roller **11**, a sheet feed pad **12**, paper powder removal rollers **13** and **14**, and registration rollers **15**. The sheet feed tray **9** is detachably mounted on a bottom portion of the body casing **2**. The sheet press plate **10** is provided in the sheet feed tray **9**. The sheet feed roller **11** and sheet feed pad **12** are provided in the front and upper side of the sheet feed tray **9**. The paper powder removal roller **13** is disposed in opposition to the sheet feed roller **11** with the paper sheet conveying path intervened therebetween. Another paper powder removal rollers **14** are disposed in the downstream side of the sheet feed roller **11** in the conveying direction of a paper sheet **3**. The registration rollers **15** are disposed in the downstream side of the paper powder removal rollers **13** and **14** in the conveying direction of the paper sheet **3**.

The sheet press plate **10** adapted to receive paper sheets **3** to be stacked thereon. When the paper sheets **3** are stacked on the sheet press plate **10**, an end portion of the sheet press plate **10** moves away from the sheet feed roller **11**. The sheet press plate **10** is urged upwardly by a spring (not shown) from the back side thereof. Therefore, as the number of stacked paper sheets **3** increases, the sheet press plate **10** is moved downwardly against the pressing force of the spring. The sheet feed roller **11** is disposed in confronting relation with the sheet feed pad **12**. The sheet feed pad **12** is pressed against the sheet feed roller **11** by a spring **16** provided on the back side of sheet feed pad **12**.

The paper sheet **3** stacked at the uppermost position on the sheet press plate **10** is pressed against the sheet feed roller **11** by the pressing force of the spring from the back side of the sheet press plate **10**. The uppermost paper sheet **3** is sandwiched between the sheet feed roller **11** and the sheet feed pad **12** and fed by rotation of the sheet feed roller **11** upon being separated from the remaining paper sheets **3**.

Further, paper powder is removed by the paper powder removal rollers **13** and **14**. Thereafter, the paper sheet **3** is conveyed by the registration rollers **15**.

The registration rollers **15** consist of a pair of rollers opposed to each other. After registration of the paper sheet **3** is completed, the registration rollers **15** convey the paper sheet **3** to a transfer position between a photosensitive drum **32** and a transfer roller **34** where a toner image on the photosensitive drum **32** is transferred to the paper sheet **3**.

The feeder section **4** further includes a multipurpose tray **17**, a multipurpose tray side sheet feed roller **18**, and a multipurpose tray side sheet feed pad **19**. The multipurpose tray side sheet feed roller **18** and multipurpose tray side sheet feed pad **19** serve to feed paper sheets **3** stacked on the multipurpose tray **17**. The multipurpose tray side sheet feed roller **18** and the multipurpose tray side sheet feed pad **19** are disposed in opposition to each other. The multipurpose tray side sheet feed pad **19** is pressed toward the multipurpose tray side sheet feed roller **18** by a spring **20** provided in the back side of the multipurpose tray side sheet feed pad **19**.

The paper sheets **3** stacked on the multipurpose tray **17** are separated one after another and fed into a nip between the multipurpose tray side sheet feed roller **18** and the multipurpose tray side sheet feed pad **19**. The paper sheet **3** is fed by rotation of the multipurpose tray side sheet feed roller **18**.

<Structure of Image Forming Section>

The image forming section **5** includes a scanner section **21**, a process cartridge **22**, a fixing section **23**.

<Structure of Scanner Section>

The scanner section **21** is disposed at an upper portion inside the body casing **2**. The scanner section **21** includes a laser light emission section (not shown), a polygon mirror **24**, lenses **25** and **26**, and reflection mirrors **27**, **28**, and **29**. A laser beam modulated based on image data emitted from the laser light emission section. Then the modulated laser beam is reflected by the polygon mirror **24**, passes through the lens **25**, and reflected by or passes through reflection mirrors **27** and

28, lens 26, and reflection mirror 29 in this order, as indicated by a chain line in FIG. 1. The laser beam is thus irradiated onto the surface of the photosensitive drum 32 contained in the process cartridge 22.

<Structure of Process Cartridge>

FIG. 2 is a side cross-sectional view of the process cartridge 22.

The process cartridge 22 is detachably mounted on the body casing 2 and disposed below the scanner section 21. This process cartridge 22 includes a drum cartridge 30, and a developer cartridge 31 which is detachably mounted on the drum cartridge 30.

<Structure of Drum Cartridge>

As shown in FIG. 2, the drum cartridge 30 includes a cartridge frame 103, a photosensitive drum 32 disposed in the cartridge frame 103, a scorotron charger 33, a transfer roller 34, and a cleaning brush 35.

FIG. 3 is a plan view of a drum cartridge 30. FIG. 4 is a bottom view of the drum cartridge 30. FIG. 5 is a side view of the drum cartridge 30.

As shown in FIG. 3, a cartridge frame 103 integrally has a left side wall 36, a right side wall 37, a bottom wall 38, a front wall 39, and a rear upper wall 40.

The left side wall 36 and the right side wall 37 are opposed to each other with an interval in the widthwise direction therebetween. Further, the left side wall 36 and the right side wall 37 have substantially symmetrical structures in the widthwise direction. As shown in FIG. 5, each of the left side wall 36 and right side wall 37 has a rear side wall portion 41 having a substantially bow-side like shape when viewed from a side, and a front side wall portion 42 extending frontwardly from the rear side wall portion 41.

In the front side wall portion 42, a roller shaft guide portion 43, and a roller shaft receiving portion 44 are formed. The roller shaft guide portion 43 guides a shaft end portion of a developer roller shaft 91 described later when the developer cartridge 31 is attached to the drum cartridge 30. The roller shaft receiving portion 44 is formed continuously with a rear end of the roller shaft guide portion 43, and receives the end portion of the developer roller shaft 91 guided by the roller shaft guide portion 43.

The roller shaft guide portion 43 is formed as a part of an upper end edge of the front side wall portion 42. That is, the roller shaft guide portion 43 extends obliquely downwardly toward the rear side from the middle of the front side wall portion 42. The roller shaft guide portion 43 is downwardly shaped and gradually flattened toward the rear side.

The roller shaft receiving portion 44 is formed below a protruding wall 45 and continuous to the rear side of the roller shaft guide portion 43. The roller shaft receiving portion 44 is a substantially in a rectangular shape when viewed from a side. A lower end edge of the protruding wall 45 is formed continuously with the rear end edge of the roller shaft guide portion 43.

Also, the front side wall portion 42 has a front engagement convex portion 46. When plural drum cartridges 30 are stacked one on the other, the front engagement convex portion 46 of the lower drum cartridge 30 is engageable with a front engagement concave portion 49 of the upper drum cartridge 30, described later This front engagement convex portion 46 is flat at the top and formed as a part of the upper end edge of the front side wall portion 42. Further, the upper front end portion 47 of the front side wall portion 42 extends obliquely downwardly toward the front side, the front engagement convex portion 46 is higher than the top flat portion of the front end portion 47 and the roller shaft guide portion 43.

As shown in FIG. 3, the bottom wall 38 is substantially flat in shape, and is provided to connect lower end edges of the left side wall 36 and the right side wall 37 in the front-to-rear direction. As shown in FIGS. 4 and 5, the bottom wall 38 has a pair of rear engagement convex portions 48, at a position below the drum shaft 56 of a photosensitive drum 32 and right and left side end portions. When plural drum cartridges 30 are stacked one on the other, the rear engagement convex portions 48 are engaged with (inserted in) rear engagement concave portions 52 (described later) of an upper drum cartridge 30. Each of the rear engagement convex portions 48 is formed of a thin plate which is curved to protrude downwardly. When a drum cartridge 30 is put on a flat mount surface S, each of the rear engagement convex portions 48 contacts the mount surface S, and supports the drum cartridge 30 such that the rear upper wall 40 and the front engagement convex portion 46 are substantially parallel to the mount surface S.

Also, a pair of front engagement concave portions 49 is formed in the bottom wall 38 at positions opposed in the widthwise direction. When plural drum cartridges 30 are stacked one on the other, the front engagement concave portions 49 are engaged with (receive) the front engagement convex portions 46 of an upper drum cartridge 30. The front engagement concave portion 49 is substantially in a rectangular shape when viewed from the bottom.

Further, as shown in FIG. 4, a pair of insertion portions 62 is formed at the left and right side end portions of the bottom wall 38. When a plurality of the drum cartridge 30 is stacked one on the other, the developer engagement convex portion 80, described later, of the lower drum cartridge 30 can be inserted in the insertion portion 62 of upper drum cartridge 30. Each of the insertion portions 62 is provided at a position near the center with respect to the front-to-rear direction, ie., between the rear engagement convex portion 48 and the front engagement concave portion 49. The insertion portions 62 are in the form of a through-hole having a substantially rectangular shape when viewed from the bottom.

The front wall 39 is bent upwardly from the front end edge of the bottom wall 38. This front wall 39 is substantially in a rectangular shape. Both end portions of the front wall 39 in the widthwise direction are bent perpendicularly and are formed continuously with the left side wall 36 and right side wall 37.

As shown in FIGS. 3 and 5, the rear upper wall 40 is a flat, plate-like member and is provided so as to connect to the upper end edges of the rear side wall portions 41 of the left side wall 36 and the right side wall 37. At the front portion of the rear upper wall 40, a laser input window 50 is formed which is substantially rectangular in shape when viewed from the top extends in the widthwise direction, as shown in FIG. 3. The rear upper wall 40 has a charger support portion 51 for supporting a Scorotron charger 33, which is disposed behind the laser input window 50.

Further, in the rear upper wall 40, a pair of rear engagement concave portions 52 is formed. When plural drum cartridges 30 are stacked one on the other, the pair of rear engagement concave portions 52 of the lower drum cartridge 30 is engageable with the pair of the rear engagement convex portions 48 at the left and right side end portions of the rear upper wall 40 of the upper drum cartridge 30. Each of the rear engagement concave portions 52 is provided at a position opposed in the vertical direction to the rear engagement convex portions 48.

Further, in the cartridge frame 103, a drum accommodating section 53 which accommodates the photosensitive drum 32, is formed by the rear side wall portions 41 of the left and right side walls 36 and 37, the rear upper wall 40, and the rear portion of the bottom wall 38 which is opposed in the vertical

direction to the rear upper wall **40**. The drum accommodating section **53** is open to the front. A developer cartridge accommodating section **54** which accommodates the developer cartridge **31** is formed by the front side wall portions **42** of the left and right side walls **36** and **37**, and the front portion of the bottom wall **38** formed continuously with each of the front side wall portions **42** in the widthwise direction. The developer cartridge accommodating section **54** is open in the upper side and communicates with the drum accommodating section **53** in the rear side.

As shown in FIG. **2**, the photosensitive drum **32** has a cylindrical drum body **55** and a metal-made drum shaft **56**. The drum body **55** is formed of a photosensitive layer having positive charges. A surface layer of the drum body **55** is made of polycarbonate. The drum shaft **56** extends in the longitudinal direction of the drum body **55** through the center of the drum body **55** to be loosely rotatable about the drum body **55**. The drum shaft **56** is fixedly supported by the left and right side walls **36** and **37** of the drum cartridge **30**. Thus, the photosensitive drum **32**, disposed between the left and the right side walls **36** and **37** is rotatable around the drum shaft **56**.

The Scorotron charger **33** is disposed above the photosensitive drum **32** and supported by the charger support portion **51**. The Scorotron charger **33** is disposed opposite to the photosensitive drum **32** without contacting each other. A predetermined interval is maintained between the Scorotron charger **33** and the photosensitive drum **32**. This Scorotron charger **33** has a wire **57**, grid **58**, and a wire cleaner **59**.

The wire **57** is stretched between the left and right side walls **36** and **37** while imparting a predetermined tension therebetween.

The grid **58** extends in the widthwise direction to surround the lower side of the wire **57**. The grid **58** is bridged between the left and right side walls **36** and **37**.

A wire cleaner **59** (see FIG. **3**) is provided to be slidably movable in the widthwise direction of the charger support portion **51**, while sandwiching and contacting the wire **57**. The sliding movement of the wire cleaner **59** cleans the wire **57**.

A transfer roller **34** is rotatably supported between the left and right side walls **36** and **37**. As shown in FIG. **2**, the transfer roller **34** is opposed to and contacts the photosensitive drum **32**, thereby forming a nip between the transfer roller **34** and the photosensitive drum **32**. This transfer roller **34** includes a transfer roller shaft **60** made of metal, and a roller **61** made of a conductive rubber material.

A cleaning brush **35** is disposed at the rear side of the photosensitive drum **32**. A lot of bristles of the cleaning brush **35** are supported on a support plate having an elongated rectangular shape extending in the widthwise direction. The cleaning brush **35** is opposed to the photosensitive drum **32** in the front-to-rear direction, such that the bristles contact the surface of the photosensitive drum **32** along the widthwise direction.

<Structure of Developer Cartridge>

FIG. **6** is a plan view of the developer cartridge **31**. FIG. **7** is a bottom view of the developer cartridge **31**. FIG. **8** is a side view of the developer cartridge **31**.

The developer cartridge **31** is detachably mounted in the developer cartridge accommodating section **54**. As shown in FIG. **2**, the developer cartridge **31** includes a box-like developer casing **63** open in the rear side, a feed roller **64**, a developer roller **65**, and a layer-thickness regulation blade **66**.

As shown in FIGS. **6** and **7**, the developer casing **63** is defined by a left side wall **67**, a right side wall **68**, a lower wall **69**, and an upper wall **70**. The left side wall **67** and the right side wall **68** are disposed opposed to each other, with an interval therebetween in the widthwise direction. The lower wall **69** and the upper wall **70** are connected to the left and right side walls **67** and **68**. As shown in FIG. **9**, when the developer cartridge **31** is mounted in the developer cartridge accommodating section **54** of the drum cartridge **30** and the drum cartridge **30** on which the developer cartridge **31** is mounted is put on the mount surface S, the upper surface (upper wall **70**) is held substantially at the same height as the upper surface of the rear upper wall **40**.

The left and right side walls **67** and **68** are in a plate-like shape extending in the front-to-rear direction. The upper wall **70** is bridged between upper end edges of both walls. The left and right side walls **67** and **68** sandwich the lower wall **69**, and are provided such that inner surfaces of the walls **67** and **68** are opposed to each other.

As shown in FIG. **8**, the left side wall **67** is provided with an intermediate gear **72**, an agitator drive gear **73**, a developer roller drive gear **74**, and a feed roller drive gear **75**. The intermediate gear **72** is toothed with an input gear **71**. The agitator drive gear **73** is provided in the front side of the intermediate gear **72**, and is meshingly engaged with the intermediate gear **72**. The developer roller drive gear **74** is positioned obliquely below the input gear **71** in the rear side of the input gear **71**, and is meshingly engaged with the input gear **71**. The feed roller drive gear **75** is provided below the input gear **71** and is meshingly engaged with the input gear **71**. Drive force from a motor (not shown) is applied to the input gear **71**.

As shown in FIG. **8**, a toner filling port **76** for filling toner in a toner accommodating section **85** is formed in the left side wall **67** obliquely above the agitator drive gear **73**. The toner filling port **76** is circular in shape, penetrating the left side wall **67** in the thickness direction at the position corresponding to the toner accommodating section **85**. The toner filling port **76** is closed by a cap **77** for preventing toner in the toner accommodating section **85** from leaking out of the toner filling port **76**.

The lower wall **69** is a plate-like member extending in the front-to-rear direction and the widthwise direction (see FIG. **7**), and includes a rear lower wall portion **78** and a front lower wall portion **79**. The rear lower wall portion **78** serves for partitioning a developer room **84** described later. The front lower wall portion **79** is continuous to the front end edge of the rear lower wall portion **78**, and has a substantially arcuate cross-sectional shape along the rotation orbit of an agitator **87** described later. The lower wall **69** is held between the left side wall **67** and the right side wall **68**.

At each of the left and right end side portions of the rear lower wall portion **78** (both side end portions in the widthwise direction), a developer engagement convex portion **80** is provided. The developer engagement convex portion **80** is inserted in insertion portions **62** of the drum cartridge **30** when the developer cartridge **31** is mounted in the drum cartridge **30**. Each of the developer engagement convex portions **80** is in a substantially rectangular shape when viewed from a side. Each of the developer engagement convex portions **80** is provided outside an area through which a paper sheet **3** entering between the photosensitive drum **32** and the transfer roller **34** passes. As shown in FIG. **8**, when the developer cartridge **31** is put on the flat mount surface S, the developer engagement convex portions **80** contact the mount surface S and support the developer cartridge **31** such that the upper wall **70** is substantially parallel to the mount surface S.

As shown in FIG. **2**, a lower partition portion **81** having a substantially triangular cross-sectional shape and protruding

upwardly is formed along the widthwise direction, at the boundary between the rear lower wall portion **78** and the front lower wall portion **79**.

As shown in FIG. **6**, the upper wall **70** is a plate-like member and is bridged between upper end edges of the left and right side walls **67** and **68**. At the rear end portions of the upper wall **70**, developer engagement concave portions **82** are formed at the left and right side end portions of the upper wall **70**. When plural developer cartridges **31** are stacked one on the other, the developer engagement concave portions **82** of the lower developer cartridge are engageable with the developer engagement convex portions **80** of the upper developer cartridge **31**. The developer engagement concave portion **82** in the left side is substantially rectangular in shape when viewed from the top. The concave portion **82** in left side is engaged with the lower end portion of the left developer engagement convex portion **80** of an upper developer cartridge **31** when plural developer cartridges **31** are stacked. On the other side, the right developer engagement concave portion **82** is formed in the form of a stepped portion lower in level by one step than the upper surface of the upper wall **70**. The right side concave portion **82** is also engaged with the lower end portion of the right developer engagement convex portion **80** of the upper developer cartridge **31** when plural developer cartridges **31** are stacked.

As shown in FIG. **2**, an upper partition plate **83** protruding downwardly is formed along the widthwise direction on the lower surface of the upper wall **70**, opposed to the lower partition portion **81** of the lower wall **69**.

Further, in this developer casing **63**, an inner space at the front side from the upper and lower partition portions **83** and **81**, is partitioned and formed as developer room **84**. Another inner space at the rear side is partitioned and formed as a toner accommodating section **85**.

In the toner accommodating section **85**, toner made from electrically positive, non-magnetic component is accommodated as a developer. Used as the toner is polymerized toner which is obtained by a known copolymerization method by which a polymerization monomer, for example, a styrene monomer such as styrene or an acrylic monomer such as an acrylic acid, alkyl (C1 to C4) acrylate, or alkyl (C1 to C4) methacrylate are coplymerized. This kind of polymerized toner grains is spherical shape and has very excellent fluidity. Therefore, images can be formed with high image quality.

Toner of this kind is mixed with a coloring agent such as carbon-black, wax, or the like. In order to improve fluidity, an external additive agent such as silica is added. The grain diameter of the external additive agent is about 6 to 10 μm.

In the toner accommodating section **85**, an agitator **87** for stirring toner in the toner accommodating section **85** is provided. At the central portion of the toner accommodating section **85**, the agitator **87** is supported by an agitator rotation shaft **88** extending in the widthwise direction.

A feed roller **64** is provided in the front lower side in the developer room **84**, and is rotatably supported between the left and right side walls **67** and **68** of the developer casing **63**. This feed roller **64** is formed of a metal-made feed roller shaft **89**, and a sponge roller **90**. The feed roller shaft **89** extends in the widthwise direction. The sponge roller **90** made of an electrically conductive foaming material covers the circumference of the feed roller shaft **89**.

The developer roller **65** is provided in the rear lower side in the developer room **84**. The developer roller **65** and the feed roller **64** are pressed against each other. The rear portion of the developer roller **65** is partially exposed rearward from the developer casing **63**. A rear part of the developer roller **65** has a metal-made developer roller shaft **91**, which is covered with a rubber roller **92** made of electrically conductive rubber material, the rubber covering the circumference of the developer roller shaft **91**. More specifically, the rubber roller **92** is made of electrically conductive urethane rubber or silicone rubber containing fine carbon grains. The surface of the rubber roller **92** is covered with urethane rubber or silicon rubber containing fluorine. As shown in FIGS. **6** and **7**, end portions of the developer roller shaft **91** in both sides extend outwardly in the widthwise direction beyond the side plates of the developer casing **63**.

As shown in FIG. **2**, the layer-thickness regulation blade **66** is formed of a metal leaf spring. The layer-thickness regulation blade **66** is provided, at the top end portion thereof with a press rubber member **93** having a semi-circular cross-section made of an electrically insulating silicone rubber. Further, the layer-thickness regulation blade **66** is supported by the developer casing **63** at a position above the developer roller **65**. The lower end portion of the layer-thickness regulation blade **66** is in contact with the rubber roller **92** of the developer roller **65**. The press rubber member **93** is pressed against the surface of the rubber roller **92** by elastic force of the layer-thickness regulation blade **66**.

FIG. **9** is a side view of a process cartridge **22** in which the developer cartridge **31** is mounted on the drum cartridge **30**. FIG. **10** is a bottom view of the process cartridge **22**.

The developer cartridge **31** is attached to the developer cartridge accommodating section **54** of the drum cartridge **30** in the following manner. That is, the developer cartridge **31** is located above the developer cartridge accommodating section **54** of the drum cartridge **30**. Further, both end portions of the developer roller shaft **91** protruding outwardly from both sides of the developer casing **63** are guided along the roller shaft guide portions **43** of the cartridge frame **103** of the drum cartridge **30**, the developer cartridge **31** is moved down. Further, both end portions of the developer roller shaft **91** are brought into contact with the rear end edges of the roller shaft receiving portions **44**, and are respectively received in the roller shaft receiving portions **44**. Then, the developer cartridge **31** is completely mounted in the drum cartridge **30**.

In this mounting process, the developer engagement convex portions **80** of the developer cartridge **31** are inserted in the insertion portions **62** of the drum cartridge **30**, as shown in FIG. **10**. Therefore, each of the developer engagement convex portions **80** does not obstruct mounting the developer cartridge **31** in the drum cartridge **30**. As a result, smooth mount of the developer cartridge **31** to the drum cartridge **30** is ensured.

Referring to FIGS. **2** and **8**, a drive force is applied to the input gear **71** of the developer cartridge **31**. By this drive force, the agitator **87** is rotated around the agitator rotation shaft **88**. Then, toner in the toner accommodating section **85** is stirred and expelled toward the developer room **84** through a section between the upper partition plate **83** and the lower partition portion **81**. Further, the toner supplied to the developer room **84** is conveyed onto the developer roller **65** by the rotation of the feed roller **64**. At this time, toner is frictionally positively charged when passing through a nip between the sponge roller **90** of the feed roller **64** and the rubber roller **92** of the developer roller **65**. The toner supplied onto the developer roller **65** enters a nip between the developer roller **65** and the press rubber member **93** of the layer-thickness regulation blade **66** along with the rotation of the developer roller **65**, thereby forming a thin toner layer having a constant thickness. The layer is carried on the developer roller **65**.

Meanwhile, the surface of the photosensitive drum **32** is positively charged uniformly by the Scorotron charger **33**. Thereafter, the surface of the photosensitive drum **32** is

exposed to a laser beam from the scanner section **21**. An electrostatic latent image based on image data is formed on the photosensitive drum **32**.

Next, the positively charged toner carried on the developer roller **65** is supplied to the electrostatic latent image formed on the photosensitive drum **32**. That is, of the photosensitive drum uniformly charged positively, toner is attracted to the exposed parts that have been exposed to the laser beam and have a lowered potential. Accordingly, the toner is selectively carried on the photosensitive drum **32**, and the latent image is thus visualized.

The paper sheet **3** is fed between the photosensitive drum **32** and the transfer roller **34**. A toner image carried on the surface of the photosensitive drum **32** is transferred to the paper sheet **3**.

<Structure of Fixing Section>

As shown in FIG. **1**, the fixing section **23** is provided in the rear side of the process cartridge **22** and in the downstream side in the conveying direction of the paper sheet **3**. The fixing section **23** includes a heating roller **94**, a press roller **95** which presses the heating roller **94**, and a pair of conveyer rollers **96**. The press roller **95** is opposed to the heating roller **94**. The pair of conveyer rollers **96** is provided in the downstream side of the press roller **95** in the conveying direction of the paper sheet **3**.

The heating roller **94** houses a halogen lamp and is made of metal for heating. In the fixing section **23**, the toner image transferred to the paper sheet **3** is thermally fixed while the paper sheet **3** passes between the heating roller **94** and the press roller **95**. Thereafter, the paper sheet **3** is conveyed to a sheet discharge path **97** by the conveyer rollers **96**. The paper sheet **3** is discharged onto the sheet discharge tray **6** by the sheet discharge rollers **98**.

In this laser printer **1**, residual toner remaining on the surface of the photosensitive drum **32** after transferring the toner image to the paper sheet **3** is collected by the developer roller **65**. If the toner remaining on the photosensitive drum **32** is collected by such a cleanerless method, neither a toner cleaner device nor a storage portion of waste toner are necessary. The structure of the device can thus be simplified.

<Structure of Reverse Conveyer Section>

The laser printer **1** is provided with a reverse conveyer section **99** to form images on both sides of the paper sheet **3**. This reverse conveyer section **99** includes sheet discharge rollers **98**, a reverse conveying path **100**, a flapper **101**, and plural reverse conveyer rollers **102**.

The sheet discharge rollers **98** are constituted by a pair of rollers and is constructed such that forward and reverse rotations can be switched to each other. In discharging the paper sheet **3** onto the sheet discharge tray **6**, the sheet discharge rollers **98** rotate in the forward direction. Otherwise, in reversing the paper sheet **3**, the sheet discharge rollers **98** rotate in the reverse direction.

The reverse conveying path **100** is arranged along the vertical direction so that the paper sheet **3** can be conveyed from the sheet discharge rollers **98** to the plural reverse conveyer rollers **102** provided below the image forming position. An end portion of the reverse conveying path **100** in the upstream side is positioned near the sheet discharge rollers **98**. Another end thereof in the downstream side is positioned near the reverse conveyer rollers **102**.

The flapper **101** is pivotally disposed in a branch portion between the sheet discharge path **97** and the reverse conveying path **100**. By energization or de-energization of a solenoid (not shown), the conveying direction can be switched from the direction toward the sheet discharge path **97** to the direction toward the reverse conveying path **100**.

Plural reverse conveyer rollers **102** are provided in the front-to-rear direction, above the sheet feed tray **9**. The reverse conveyer roller **102** in the most upstream side is positioned near the rear end portion of the reverse conveying path **100**. The reverse conveyer rollers **102** in the most downstream side is positioned below the registration rollers **15**.

Further, to form images on both sides of the paper sheet **3**, this reverse conveyer section **99** is operated as follows. A paper sheet **3** having a surface on which an image has been formed is conveyed from the sheet discharge path **97** to the sheet discharge rollers **98** by the conveyer rollers **96**. Then, the sheet discharge rollers **98** forwardly rotate with the paper sheet **3** sandwiched therebetween, and convey the paper sheet **3** to the outside (the side of the sheet discharge tray **6**). When most part of the paper sheet **3** is fed to the outside and the rear end of the paper sheet **3** is sandwiched between the sheet discharge rollers **98**, the sheet discharge rollers **98** stop rotating. Subsequently, the sheet discharge rollers **98** rotate in the reverse direction, and the flapper **101** pivots to switch the conveying direction such that the paper sheet **3** is conveyed to the reverse conveying path **100**. The paper sheet **3** is conveyed to the reverse conveying path **100** with the top and bottom of the paper sheet **3** reversed. After conveyance of the paper sheet **3** is completed, the flapper **101** is switched to an original state, i.e., a state in which the paper sheet **3** fed from the conveyer rollers **96** is sent to the sheet discharge rollers **98**.

Subsequently, the paper sheet **3** conveyed to the reverse conveying path **100** in the opposite direction is further conveyed to the reverse conveyer rollers **102**. From the reverse conveyer rollers **102**, the paper sheet **3** is conveyed upwardly and further reversed, and sent to the registration rollers **15**. The paper sheet **3** conveyed to the registration rollers **15** is subjected to registration again. Thereafter, the paper sheet **3** is fed to the image forming position. Images are thus formed on both sides of the paper sheet **3**.

<Stacking of Process Cartridges>

FIG. **11** is a side view showing a state in which two drum cartridges **30** are stacked. FIG. **12** is a side view showing a state in which developer cartridges **31** are mounted in the drum cartridges **30**. FIG. **13** is a side view showing a state in which two developer cartridges **31** are stacked.

According to the structure as described above, the rear engagement convex portions **48** are formed on the bottom wall **38** of the cartridge frame **103** of the drum cartridge **30**. Formed on the rear upper wall **40** are the rear engagement concave portions **52** engageable with the rear engagement convex portion **48**. The front engagement concave portions **49** are also formed on the bottom wall **38**. Formed on the front side wall portions **42** of the left and right side walls **36** and **37** are the front engagement convex portions **46** each being engageable with the front engagement concave portion **49**. Therefore, another drum cartridge **30** is provided on a drum cartridge **30** as shown in FIG. **11**, or another process cartridge **22** is provided on a process cartridge **22** as shown in FIG. **12**. Then, the rear engagement convex portions **48** of the upper drum cartridge **30** (process cartridge **22**) can be engaged with the rear engagement concave portions **52** of the lower drum cartridge **30** (process cartridge **22**). Simultaneously, the front engagement concave portions **49** of the upper drum cartridge **30** (process cartridge **22**) can be engaged with the front engagement convex portions **46** of the lower drum cartridge **30** (process cartridge **22**). Likewise, another drum cartridge **30** (process cartridge **22**) may be stacked on the upper drum cartridge **30** (process cartridge **22**), may be stacked on the

upper drum cartridge **30** (process cartridge **22**). Then, the rear engagement convex portions **48** and the front engagement concave portions **49** of the upper drum cartridge **30** (process cartridge **22**) can be engaged with the rear engagement concave portion **52** and the front engagement convex portion **46** of the lower drum cartridge **30** (process cartridge **22**) respectively.

As a result, plural drum cartridges **30** can be stacked stably by concave-convex engagement between the individual drum cartridges **30**. When drum cartridges **30** are detached from the laser printer **1** (body casing **2**), the drum cartridges **30** can be handled easily. In addition, the space for storing the drum cartridge **30** can be reduced.

Also, plural process cartridges **22** can be stacked stably by concave-convex engagement between the individual process cartridges **22**. When process cartridges **22** are detached from the laser printer **1** (body casing **2**), the process cartridges **22** can be handled easily. And, the space for storing the process cartridge **22** can be reduced.

As shown in FIG. **4**, the rear engagement convex portions **48**, front engagement concave portions **49**, rear engagement concave portions **52**, and front engagement convex portions **46** are provided in both the left and right sides (both sides in the widthwise direction). Therefore, by concave-convex engagement between these portions, plural drum cartridges **30** can be stacked more stably. Similarly, by concave-convex engagement between these portions, plural process cartridges **22** can be stacked more stably.

In addition, when a drum cartridge **30** (see FIG. **5**) or a process cartridge **22** (see FIG. **9**) is put on the flat mount surface S, each of the rear engagement convex portions **48** contacts the mount surface S, and supports the drum cartridge **30** or process cartridge **22** such that the rear upper wall **40** and the front engagement convex portion **46** are substantially parallel to the mount surface S. On the drum cartridge **30** put on the mount surface S, plural drum cartridges **30** can be stacked much more stably. Similarly, on the process cartridge **22** put on the mount surface S, plural process cartridges **22** can also be stacked much more stably.

The rear engagement concave portions **52** and the front engagement convex portions **46** are at such positions that are opposed to the rear engagement convex portions **48** and the front engagement concave portions **49** in the vertical direction. Therefore, plural drum cartridges **30** can be stacked in the vertical direction. As a result, the plural drum cartridges **30** can be stacked more stably. Similarly, plural process cartridges **22** can be stacked in the vertical direction. As a result, the plural process cartridges can be stacked more stably.

Further, the rear engagement concave portions **52** and the front engagement convex portions **46** are spaced apart therebetween in the front-to-rear direction. The rear engagement convex portions **48** and the front engagement concave portions **49** are space apart therebetween in the front-to-rear direction.

Therefore, the state in which plural drum cartridges **30** are stacked can be kept more stably in the front-to-rear direction, by concave-convex engagement between the respective cartridges. As a result, plural drum cartridges **30** can be stacked more stably.

Also, the state in which plural process cartridges **22** are stacked can be kept more stably in the front-to-rear direction, by concave-convex engagement between the respective cartridges. As a result, plural process cartridges **22** can be stacked more stably.

In other words, the rear engagement concave portion **52** and the rear engagement convex portions **48** which are opposed to each other in the vertical direction are considered as one set. The front engagement convex portion **46** and the front engagement concave portion **49** which are opposed to each other in the vertical direction are considered as one set. These sets spaced apart in the front-to-rear direction. For each set, two sets are provided in the widthwise direction. Therefore, in the front-to-rear direction and in the widthwise direction, the plural drum cartridges **30** can be stacked one on the other, kept stable in the vertical direction. Similarly, in the front-to-rear direction and in the widthwise direction, the plural process cartridges **30** can be stacked one on the other, kept stable in the vertical direction.

In the present embodiment, as shown in FIG. **9**, when the developer cartridge **31** is mounted on the developer cartridge accommodating section **54** of the drum cartridge **30**, and these cartridges are put on the mount surface S, a height from the mount surface S to the upper surface (the upper wall **70**) of the developer casing **63** of the developer cartridge **31** is substantially equal to the height from the mount surface S to the upper surface of the rear upper wall **40**. As shown in FIG. **12**, when the developer cartridge **31** is mounted on the drum cartridge **30**, the plurality of process cartridge **22** (the drum cartridge with the developer cartridge) can be stacked stably.

As shown in FIG. **8**, the developer cartridge **31** is provided with the developer engagement convex portions **80**. When the developer cartridge **31** is put on a flat mount surface S, the developer engagement convex portions **80** contact the mount surface S and support the developer cartridge **31** such that the upper wall **70** of the developer casing **63** is substantially parallel to the mount surface S. Therefore, as shown in FIG. **13**, another developer cartridge **31** can be stacked on a developer cartridge **31** put on the mount surface S.

In addition, the developer engagement convex portions **80** are provided in both the left and right sides of the developer cartridge **31**. When the developer cartridge **31** is put on a mount surface S, the upper wall **70** of the developer casing **63** substantially parallel to the mount surface S in the widthwise direction. Therefore, another developer cartridge **31** can be stacked stably on the developer cartridge **31** put on the mount surface S.

The insertion portions **62** are formed in the drum cartridge **30**. When the developer cartridge **31** is mounted on the drum cartridge **30**, the developer engagement convex portions **80** are inserted in the corresponding insertion portions **62**. Therefore, the developer engagement convex portions **80** are prevented from obstructing mounting of the developer cartridge **31** in the drum cartridge **30**. As a result, smooth mounting of the developer cartridge **31** to the drum cartridge **30** can be ensured.

Besides, each of the insertion portions **62** is provided outside the area through which the paper sheet **3** entering between the photosensitive drum **32** and the transfer roller **34** passes. Therefore, when the developer cartridge **31** is mounted on the drum cartridge **30**, the developer engagement convex portions **80** inserted in the corresponding insertion portions **62** are prevented from obstructing passage of the paper sheet **3**.

In addition, the developer engagement concave portions **82** each being engageable with the developer engagement convex portion **80** are formed in the upper wall **70** of the developer casing **63** of the developer cartridge **31**. Therefore, when developer cartridge **31** can be put on the developer cartridge **31**, the developer engagement convex portions **80** of the upper developer cartridge **31** can be engaged with the developer engagement concave portions **82** of the lower developer cartridge **31**. Likewise, when further developer cartridge **31** can be put on the upper developer cartridge **31**, and the developer engagement convex portions **80** of the upper developer car-

tridge **31** can be engaged with the developer engagement concave portions **82** of the lower developer cartridge **31**. As a result, plural developer cartridges **31** can be put, stacked stably, by engaging the developer engagement convex portions **80** with the corresponding developer engagement concave portions **82**. Therefore, when developer cartridges **31** are put out of the laser printer **1** (body casing **2**), handling of the developer cartridges **31** can be facilitated. In addition, the space for storing the developer cartridges **31** can be reduced.

The developer cartridge **31** has a toner accommodating section **85** for accommodating toner. When the developer cartridge **31** is mounted on the drum cartridge **30**, the developer cartridge **31** can supply the photosensitive drum **32** supported by the drum cartridge **30** with the toner accommodated in the toner accommodating section **85**.

The laser printer **1** has a drum cartridge **30** (process cartridge **22**) and a developer cartridge **31** as described above. Therefore, in case where the manufacturer of the laser printer **1** recycles process cartridges **22**, handling of drum cartridges **30** and developer cartridges **31** is facilitated. In addition, the space for storing the drum cartridges **30** and developer cartridges **31** can be reduced.

While the invention has been described in detail with reference to the specific embodiment thereof, it would be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention.

What is claimed is:

1. A developer cartridge, detachably mountable in an image-bearing member cartridge formed with two insertion portions, the developer cartridge comprising:

a first developer wall defining a lower surface of the developer cartridge and being provided with:

two convex parts protruding downward and that are arranged in a first direction, each of the two convex parts providing a first lowermost area of the developer cartridge;

a guide portion located between the two convex parts with respect to the first direction, the guide portion being configured for guiding a recording medium when the recording medium moves between the two convex parts in a second direction perpendicular to the first direction; and

a curved surface that protrudes downward and that provides a second lowermost area of the developer cartridge; and

a second developer wall exclusively defining an upper surface of the developer cartridge;

wherein:

when the developer cartridge is put on a flat surface with the first developer wall facing downward, the two first lowermost areas and the second lowermost area contact the flat surface so as to support the developer cartridge; and

the two convex parts are insertable into the two insertion portions when the developer cartridge is mounted on the image-bearing member cartridge.

2. The developer cartridge as claimed in claim **1**,

wherein the second developer wall has a flat surface part; and

an imaginary plane connecting the first lowermost area to the second lowermost area is parallel to the flat surface part.

3. The developer cartridge as claimed in claim **2**, wherein the second developer wall has two concave surface parts, wherein when a plurality of the developer cartridges are stacked one on the other with the first developer wall being downside with respect to the second developer wall, the two convex parts in one developer cartridge engage the two concave surface parts in another developer cartridge disposed just below the one developer cartridge.

4. The developer cartridge as claimed in claim **1**, wherein the developer cartridge supplies a toner to an image-bearing member supported by the image-bearing member cartridge.

5. The developer cartridge as claimed in claim **1**, wherein the two convex parts and the curved surface define an imaginary plane,

wherein the second developer wall has an outer surface,

wherein the imaginary plane is substantially parallel with the outer surface of the second developer wall.

6. A developer cartridge, detachably mountable in an image-bearing member cartridge, the developer cartridge comprising a developer main casing comprising:

a first developer wall defining a lower surface of the developer cartridge and being provided with:

two first developer engagement parts that protrude downward and that are arranged in a first direction, each of the two first developer engagement parts defining a first lowermost area of the developer cartridge;

a guide portion that is located between the two first developer engagement parts with respect to the first direction, the guide portion being configured for guiding a recording medium when the recording medium moves between the two convex parts in a second direction perpendicular to the first direction;

a curved surface that protrudes downward and that provides a second lowermost area of the developer cartridge; and

a second developer wall exclusively defining an upper surface of the developer cartridge and being provided with two second developer engagement parts;

wherein:

when the developer cartridge is put on a flat surface with the first developer wall facing downward, the first lowermost area and the second lowermost area contact the flat surface; and

when a plurality of the developer cartridges are stacked one on the other with the first developer wall being downside with respect to the second developer wall facing upward, the two first developer engagement parts in one developer cartridge engage the two second developer engagement parts in another developer cartridge disposed just below the one developer cartridge.

7. The developer cartridge as claimed in claim **6**, wherein the developer cartridge supplies a toner to an image-bearing member supported by the image-bearing member cartridge.

8. An image-forming device comprising a developer cartridge, detachably mountable in an image-bearing member cartridge formed with two insertion portions, the developer cartridge comprising:

a first developer wall defining a lower surface of the developer cartridge and being provided with:

two convex parts protruding downward and that are arranged in a first direction, each of the two convex parts providing a first lowermost area of the developer cartridge; and

a guide portion located between the two convex parts with respect to the first direction, the guide portion being configured for guiding a recording medium when the recording medium moves between the two convex parts in a second direction perpendicular to the first direction; and

a curved surface that protrudes downward and provides a second lowermost area of the developer cartridge; and

a second developer wall exclusively defining an upper surface of the developer cartridge;

wherein:

when the developer cartridge is put on a flat surface with the first developer wall facing downward, the first lowermost area and the second lowermost area contact the flat surface so as to support the developer cartridge; and

the two convex parts are insertable into the two insertion portions when the developer cartridge is mounted on the image-bearing member cartridge.

9. A developer cartridge comprising:

a first developer wall formed defining a lower surface of the developer cartridge and provided with:

two convex parts protruding downward and that are arranged in a first direction, each of the two convex parts providing a first lowermost area of the developer cartridge:

a guide portion located between the two convex parts with respect to the first direction, the guide portion being configured for guiding a recording medium when the recording medium moves between the two convex pads in a second direction perpendicular to the first direction; and

curved surface protruding downward and providing a second lowermost area of the developer cartridge; and

a second developer wall exclusively defining an upper surface of the developer cartridge and having a flat surface part; and

wherein:

when the developer cartridge is put on a flat surface with the first developer wail facing downward, the first lowermost areas and the second lowermost area contact the flat surface; and

an imaginary plane connecting the first lowermost area to the second lowermost area is parallel to the flat surface part.

10. The developer cartridge as claimed in claim **9**, wherein the second developer wall has two concave surface parts,

wherein when one developer cartridge is stacked on another developer cartridge with the first developer wall of the one developer cartridge being downside with respect to the second wall of the one developer cartridge and with the first developer wall of the another developer cartridge being downside with respect to the second developer wall of the another developer cartridge, the two convex parts of the one developer cartridge engages two concave surface parts of the another developer cartridge disposed just below the one developer cartridge.

11. The developer cartridge as claimed in claim **9**,

wherein the first developer wall has at least two edges along which each of the two convex parts is formed.

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